I. THE FAST NEUTRON PRODUCTION RATE AT GREAT DEPTHS IN THE LUNAR SOIL. II. THE RADIOACTIVE RARE GASES AND TRITIUM IN THE SAMPLE RETURN CONTAINER, R. W. Stoenner, R. Davis Jr. and M. Bauer, Chemistry Department, Brookhaven National Laboratory, Upton, New York 11973

The fast neutron flux was measured in the Apollo 16 drill stem by determining the ^{37}Ar produced in lunar soil by the $^{40}Ca(n,\alpha)^{37}Ar$ reaction. Samples were measured at depths from 83 to 342 g/cm^2. The gaseous radioactivities ^{37}Ar (35 d), ^{39}Ar (269 g), ^{222}Rn (3.8 d) and tritium (12.4 y) released by vacuum melting were determined, and an aliquot of each sample was analyzed for K, Ca, Ti, Fe, and Mn. The results are presented in the tables.

Activity in dpm/kg

Sample No.	Depth g/cm^2	^{37}Ar	^{39}Ar	^{222}Rn	T
60006,12	83	62.8 ± 2.4	11.5 ± 0.6	0.34 ± 0.01	130 ± 4
60004,18	143	59.5 ± 2.0	8.0 ± 0.5	0.38 ± 0.01	442 ± 10
60004,10	205	39.4 ± 1.9	6.6 ± 0.5	0.49 ± 0.01	166 ± 2
60003,6	272	31.7 ± 1.7	3.5 ± 0.5	0.70 ± 0.01	151 ± 5
60001,13	342	20.8 ± 1.2	2.7 ± 0.4	0.81 ± 0.02	227 ± 6

Percent Composition

Sample No.	K	Ca	Ti	Fe	Mn
60006,12	0.25	11.7	0.33	3.9	0.063
60004,18	0.27	11.5	0.41	4.8	0.069
60004,10	0.23	11.4	0.39	4.8	0.065
60003,6	0.35	11.7	0.39	5.0	0.068
60001,13	0.34	11.7	0.37	4.7	0.067

Combining the ^{37}Ar data above with similar measurements at more shallow depths (surface to 27 g/cm^2) by Fireman and his associates (SAO) one obtains the entire depth profile. The argon production reaches a peak in the range 50-100 g/cm^2 and falls off with greater depth with an experimental mean free path of about 190 g/cm^2. The depth profiles will be interpreted in terms of the nucleonic cascade arising from galactic cosmic ray bombardment.

FAST NEUTRON PRODUCTION RATE

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Measurements of the ^{37}Ar, ^{39}Ar, ^{222}Rn and tritium activities extracted from the sample return container (SRC) from the Apollo 16 and 17 missions will be reported. The following activities were observed in SRC No. 2 of the Apollo 16 mission: 0.155 ± 0.005 dpm ^{37}Ar, <0.002 dpm ^{39}Ar, 0.151 ± 0.009 dpm ^{222}Rn, and 0.087 ± 0.004 dpm tritium. These will be compared to results obtained from previous missions and the emanation characteristics of lunar materials will be derived.